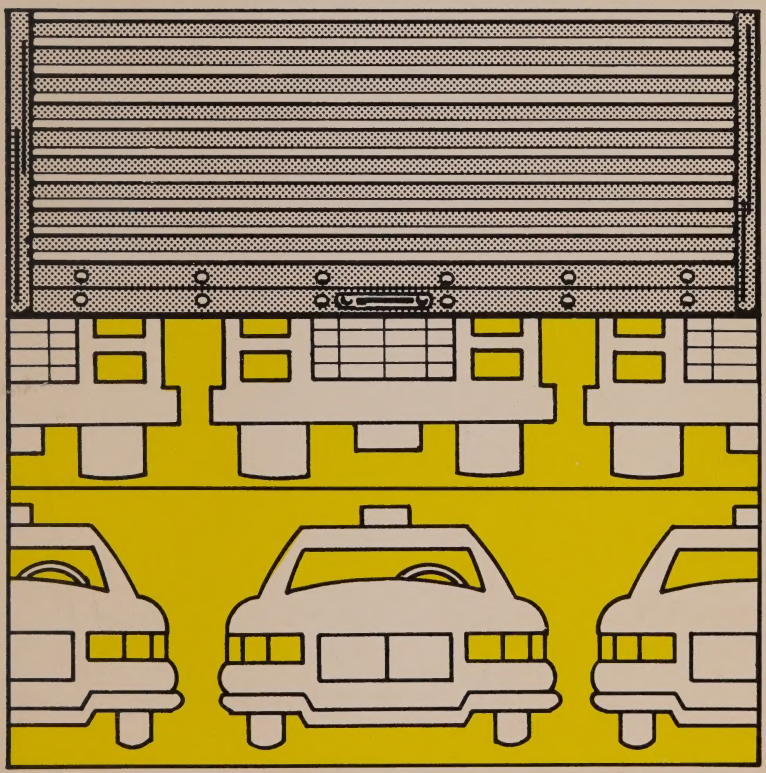
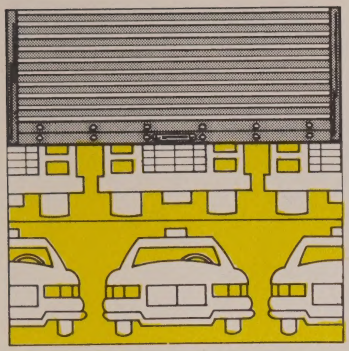
Energy Conservation through Fleet Management

An Overview of Municipal Opportunities





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An Overview of Municipal Opportunities

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Transportation Energy Management Program

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October 1982

Introduction

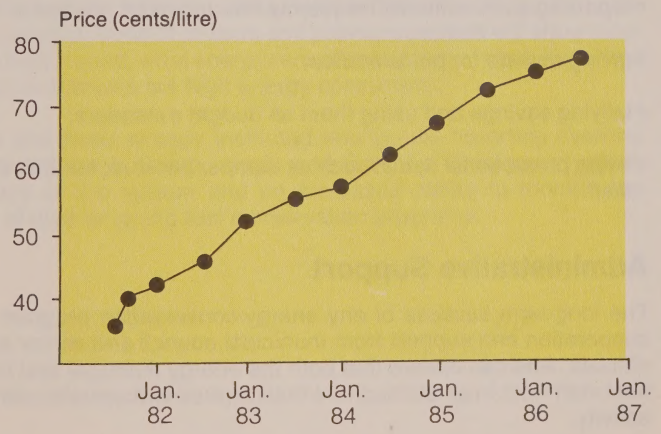
Seeing municipal vehicles at work can often be the most tangible link taxpayers have with the operation of their local government. Police cars, snow-clearing equipment, and maintenance vehicles are constant reminders of the essential services provided by the municipality. The appropriateness of this equipment and the efficiency of its use can play a large part in shaping taxpayers' attitudes on how their tax money is spent. With the transportation component of everyone's budget rising dramatically, effective fleet management measures offer significant and highly visible savings for any municipality.

Over the last five years, the fastest growing operational expense in municipal fleets has been the cost of fuel. Between 1979 and 1980 alone, gasoline costs rose 30% compared to the 10-12% increase in other fleet costs. Under the National Energy Program this trend is expected to continue through the decade and beyond, with prices doubling from their 1982 level by 1986.

This booklet outlines a range of fuel-saving techniques and fuel substitution measures that have proved effective in reducing municipal fleet operating costs. These techniques have already yielded significant savings in a number of Ontario municipalities.

- The City of Ottawa is saving between 30 and 50% in annual fuel costs and over 10% in maintenance on each of the diesel-powered trucks (over 20 000 GW) it has introduced to its fleet (compared to equivalent gasoline-powered models).
- The Hamilton-Wentworth Police Department is saving 24% in annual fuel costs, or $1335 per vehicle, on the portion of its fleet converted to propane.
- Other municipalities are saving up to $1000 per year in fuel costs for each high-mileage vehicle they replace with a smaller-sized one.

Projected Increases in Gasoline Prices under the National Energy Program



Source: Energy, Mines and Resources Canada.

Keys to Success

Reports from Ontario municipal fleets that have begun to implement fuel-saving measures show that certain elements are vital to success: the introduction of a record-keeping system that produces information on fuel-use patterns, the appointment of a municipal energy-conservation manager, and the support of municipal council and senior administration.

Energy Records

The first task to be carried out in an energy-conservation program is to determine exactly how fuel is being used at present. Once a uniform method of collecting data has been introduced in each municipality, and the data have been assembled and analyzed, conservation opportunities usually become evident, and appropriate measures can be initiated. An immediate reduction in total fuel use is usually accomplished.

The Energy Manager

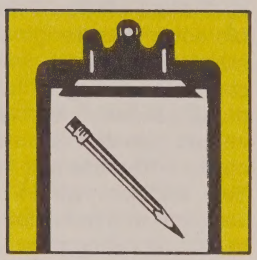
In the most aggressive and effective Ontario conservation programs, an individual or group has been designated specifically to promote and monitor energy saving. This person or group serves as a focus for the program and provides a contact point to which politicians and the public can bring questions and suggestions. The energy manager should have the knowledge required to implement a realistic program with attainable goals and should be able to motivate staff in such a way that the program is continually effective. Motivational approaches could include:

- involving staff in program design and evaluation;
- reporting achievements frequently through short notices or newsletters;
- giving awards for performance;
- tallying savings and using them as budget extenders;
- using promotional items, such as bumper stickers, for both the public and staff.

Administrative Support

The long-term success of any energy-conservation program depends on cooperation and support from municipal council and senior administrative officials, who can ensure that both the energy manager and the municipal-fleet staff work in an atmosphere that inspires enthusiastic commitment and activity.

Energy Management Measures

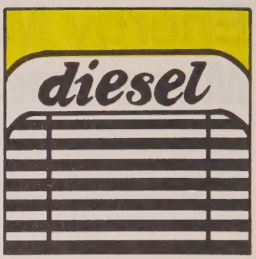


Measure One:

Energy-Use Reporting

Municipal fleet managers who want to have a firm grasp on the cost element with the highest growth rate – fuel – will diligently monitor the per-tank performance of every vehicle in the fleet. To this end they must establish a reporting system that isolates fuel use from overall vehicle costs. The volume of fuel used as well as its cost must be available. This information can easily be gathered at each vehicle fill-up from odometer and fuel-pump readings. Once data are available, appropriate reports can be generated. Basic elements such as total fuel costs, total vehicle-kilometres, fuel consumption, and comparisons of present and previous periods will show managers how the fleet is used, what energy reductions have been achieved, and which vehicles and drivers are high energy consumers.

Municipalities that have already instituted energy-use reporting systems include Niagara, Ottawa, Scarborough, and Oakville. They report excellent acceptance of the system and an increased ability to monitor the effectiveness of their on-going fuel conservation programs.



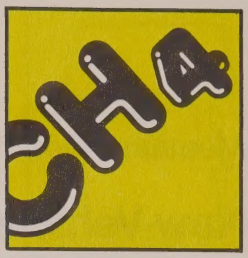
Measure Two:

Dieselization

One popular way to reduce municipal fuel consumption is to replace gasoline-engined with diesel-engined vehicles. Not only is the diesel engine itself more efficient; diesel fuel is 4-6% cheaper than unleaded gasoline. Moreover, diesel engines tend to have longer operating lives and require less maintenance, thus generating further savings. Although the higher initial cost of converting to diesel may counterbalance some of these benefits, and municipalities must exercise caution in the choice of specific models, the introduction of this measure is generally considered effective in reducing costs. The municipal fleets of Oakville, Durham, Ottawa, Nepean, North York, and many others have had positive experiences using diesel-engined vehicles, with reductions of 30-50% in fuel consumption reported for heavy trucks, travelling over 10 000 kilometres a year, trucks with high idle time, and light vehicles whose annual use exceeds 25 000 kilometres.

Measure Three:

Alternative Fuels



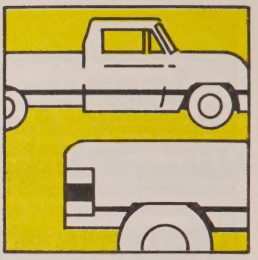
Of the alternative fuels possible, propane is currently the most viable, and its use in Ontario municipal fleets has been increasing rapidly as a result of Ontario and Federal government incentive programs and the "Drive Propane" program of the Government of Ontario. Propane is advantageous because it costs less and provides maintenance savings. The cost of propane equipment must be considered as a factor, along with vehicle use and expected service life, in calculating savings. Several municipalities, however, have demonstrated that overall savings can be substantial. For instance, when the Niagara Municipal Police converted 67 of its fleet of over 150 vehicles to propane in 1981, it realized annual fuel-consumption savings of $2040 per vehicle compared to gasoline, and savings in operational costs of 30%. Light-duty fleets in Ottawa, Oakville, and Niagara Regional Municipality using propane have reduced direct fuel costs by 35-40%. Larger fleets will benefit most from propane, because fixed costs (fuel-storage and personnel training) can be spread over more vehicles. In the longer term, other options will be available. Research is advancing on fuels such as compressed natural gas and methanol.

For more information about the "Drive Propane" program, please contact:

Drive Propane
Ontario Ministry of Transportation
and Communications
1201 Wilson Avenue
Downsview, Ontario
(416) 248-7296

Measure Four:

New-Vehicle Resizing



Both the reduction and the increase of vehicle size can lead to significant fuel conservation. As each vehicle in the municipal fleet comes due for replacement, it can be evaluated to determine whether its capacity has regularly been underused or overtaxed. An underused car can be downsized, with typical savings of up to 40 or 50% in operating costs. The police fleet of the City of Ottawa has downsized non-patrol vehicles and is considering ways to meet patrol-car specifications for speed and interior size without employing full-size cars. By contrast, a vehicle that has been chronically loaded to capacity can be replaced with a larger vehicle and still provide overall cost efficiency. For example, a 5-ton truck offers a 66% increase in payload with only a 25% increase in direct fuel consumption compared with a 3-ton vehicle.

Typical Reductions in Vehicle Operating Costs by Changing Vehicle Size

	New Size			
Original Size	Full Size	Intermediate	Compact	Sub-Compact
Full size	–	10-15%	20-30%	40-50%
Intermediate	Increase	–	15-25%	30-40%
Compact	Increase	Increase	–	20-30%
Sub-compact	Increase	Increase	Increase	–

Measure Five:

Fuel-Saving Options and Devices

Depending on the specific uses to which a vehicle is put and the speeds that it regularly maintains, its fuel costs can be significantly reduced (5-10%) by the introduction of certain tested options and devices. For optimal cost saving, these are best installed at the time of vehicle purchase.

Radial tires bring cost savings on patrol cars and vehicles used for highway driving. In urban driving, they bring only minimal savings and may be damaged by curb scuffing.

Drag-reducing devices are effective primarily on vehicles used in high-speed situations. Truck-box covers can prove useful on light trucks. Police and emergency vehicles should avoid, wherever possible, using large "light displays", which impede aerodynamic flow.

Improved engine lubricants (friction or viscosity-modified) can decrease fuel consumption by up to 5%. Viscosity-improved lubricants (0W or 5W-30) are especially helpful during the winter months in lessening cold-engine friction.

Thermostatically controlled radiator fans and shutters, if purchased as original options, reduce the auxiliary power needed for cooling and bring engine temperatures rapidly to normal. With these devices, fuel savings of 5% are possible.

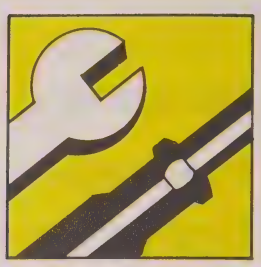
Transmission and axle ratios appropriate to vehicle use can produce fuel savings. Municipalities have found no significant overall difference in fuel use between automatic and manual transmissions. They recommend low final drive ratios, "lock-up" transmission in high gear in vehicles with automatic transmissions, and restriction of overdrive on manual transmissions to vehicles used for highway driving.

Tag axles: Use of tag (not power driven) axles in such vehicles as dump trucks can increase drivetrain efficiency and save on capital and fuel costs.

Light Weight Vehicles and accessories are practical in many situations and significantly conserve fuel. Unnecessary weights, such as ballast sand for snow plows should be removed when not needed. Savings of 1% can be achieved for every 45 kg of weight removed.

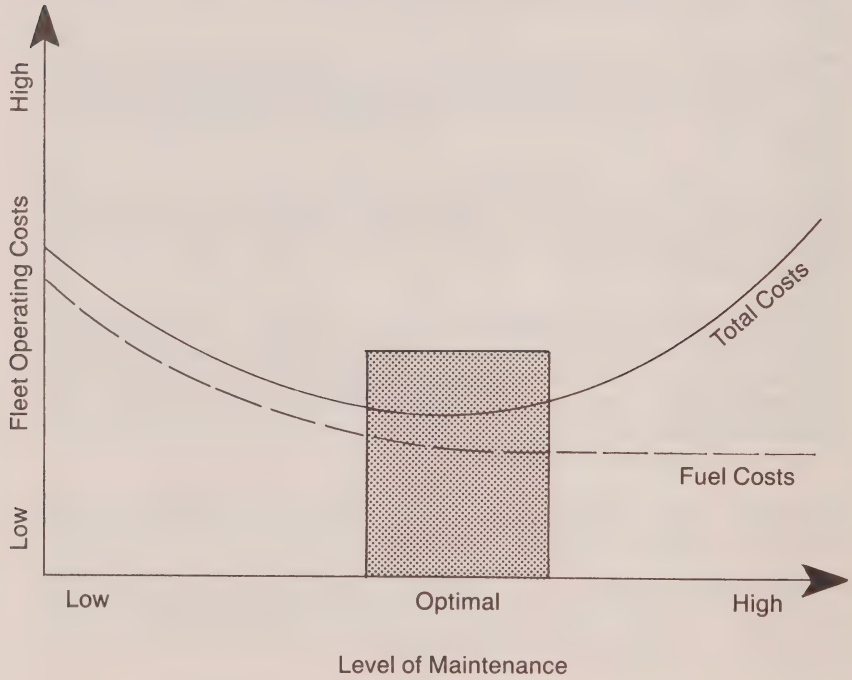
Measure Six:

Vehicle Maintenance



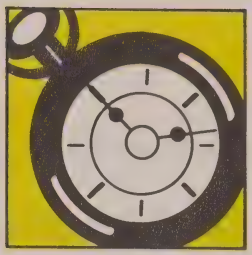
To achieve optimal fuel and operating cost savings, municipal fleets must provide vehicle maintenance at regular intervals, preferably according to the schedules suggested by the vehicle manufacturer. A regular "walk-around" inspection of a vehicle will often reveal small problems which can be corrected before they become major and costly repairs. Infrequent inspection and maintenance permits vehicle deterioration. Too-frequent inspection and adjustment or replacement of components yields no significant cost savings. The engine adjustments most frequently needed are: idle air/fuel ratio, timing, idle speed, and governor speed (where applicable).

Trade-Off Operation Costs to Level of Maintenance



Measure Seven:

Improved Vehicle Productivity



Examining the use of existing vehicles with the aim of increasing their output is an attractive approach to fuel saving in municipal fleets because it generally relies on common sense and planning ability rather than on capital expenditure.

Reviewing the Route. Vehicles that travel repetitive routes (snow plows, garbage trucks, and road-patrol vehicles) are prime candidates for review. Routes for these vehicles can be redesigned so that stops, left-hand turns, and deadheading are minimized or done away with, and time and vehicle-kilometres saved. Snow plows can be refuelled away from the depot and routed back to the depot on unplowed roads. Garbage trucks can use alternate landfill sites, and, where feasible, two-sided street pickup. Patrols to monitor road quality can be decreased and greater reliance placed on information gathered from non-patrol vehicles and complaint calls. The Metro Toronto Roads and Traffic Department, for example, has eliminated 50% of its road-patrol requirements.

Matching Vehicle to Job. Another way to increase vehicle productivity is to use the proper vehicle for the job. In large fleets motor pools can be established and vehicles assigned according to immediate need, or vehicles can be rented for special needs. In assigning service vehicles, the smaller one should always be preferred. With dump trucks, savings increase with increased vehicle capacity.

Dispatching by Radio. Finally, many municipalities have found that operations can be coordinated effectively and needless trips saved by the use of radio-dispatching.

Measure Eight:

Driver Training

By providing drivers with a knowledge of fuel-saving techniques as well as incentives to reduce fuel use, municipalities can save 5-10% in fuel costs. Aspects of such a program would include:

- Instructing drivers in cost-saving driving practices, such as:
  - Avoiding unnecessary idling
  - Avoiding heavy acceleration
  - Gear-changing at lower rev's
  - Not riding the clutch
  - Avoiding speeds above 90 km/h
  - Avoiding areas of traffic congestion
  - Minimizing stops and left-hand turns
  - Checking tire inflation (daily on trucks, monthly on light vehicles)
  - Checking for mechanical problems
  - Driving defensively. Anticipating traffic situations.
- Encouraging communication between vehicle users and maintenance personnel to promote the early detection of problems.
- Monitoring the fuel consumption of individual drivers, wherever this is possible.

"Engines off" campaigns have been successfully conducted in many municipal fleets, and provide drivers with basic information. For instance:

- To idle a vehicle requires far more fuel than to start it.
- Fifteen minutes of idle fuel flow is enough to supply 4 km of driving.

Awards and incentives have proved helpful in making these programs successful.

Measuring Payback

Whatever saves energy reduces direct fuel costs. But sometimes the cost of a conservation measure outweighs whatever savings it might engender, or limited funds might be better spent elsewhere. To determine the actual cost/benefits involved in any energy-conservation decision, fleet managers can utilize one of two methods: Payback Period Analysis or Life-Cycle Costing. The accuracy of either is based on the accuracy of data derived from municipal records and equipment suppliers.

Payback Period Analysis

The "payback period" method focuses on the time required for the savings in energy costs to offset the original price premium. The simple payback method assumes no increase in fuel prices or in the cost of money. The discounted payback method adjusts for both these variables. By simply dividing the initial cost premium by the projected savings in fuel and maintenance, the simple payback period can be calculated. (A limitation of this straightforward analysis is that it ignores the effect of costs or benefits occurring after the payback period.)

Life-Cycle Costing

The life-cycle costing method compares the initial cost premium with future savings, after converting all dollar values to their present value. It takes into consideration rising fuel prices and the time value of money, and includes all costs and savings over the service life of the vehicle, that is, even after the payback period has ended.

A Blueprint for Savings

Among the municipal-fleet energy-conservation measures described in the previous sections, there are some that should logically precede others. The recommended sequence follows.

Step 1: Appointment of a Manager

Within each municipality, an energy-conservation coordinator or group is appointed. This person or group carries responsibility for overseeing the development and implementation of all conservation measures and for acting as liaison with municipal officials, fleet staff, community residents, and others.

Step 2: Fleet Inventory and Analysis

A profile of the existing fleet is developed. This profile contains, according to vehicle type: number of vehicles, annual use, annual fuel consumption, consumption rate, typical function performed, and average service life. The data are analyzed to pinpoint vehicles with the highest fuel consumption and those with the shortest service life.

Step 3: Modification of New-Vehicle Specification

Specifications for vehicles with the shortest service life are upgraded to incorporate fuel-efficiency measures. Life-cycle costing is used. Fuel-saving alternatives to be considered at this stage are: reduction of vehicle size or weight, or engine size; use of diesel or propane engines; use of recommended options.

Step 4: Driver-Training Program

A driver-training program is instituted, stressing a reduction in idling, lower speeds, traffic anticipation, and proper braking. Incentives are used.

Step 5: Vehicle-Maintenance Program

The vehicle-maintenance program is studied to determine changes that might save fuel. Emphasis is on repairs to dragging brakes, sticking chokes, and cold-running or high-idling engines.

Step 6: Current Vehicle Upgrading

Each piece of equipment is reviewed to ensure that appropriate cost-effective fuel-saving equipment has been installed.

Step 7: Vehicle Operations Review

Vehicle operations are surveyed to determine whether route changes and the use of two-way radios can be introduced, and whether the smallest, lightest vehicle is being employed for each fleet task.

Step 8: Fleet Monitoring

The fleet manager and the conservation manager monitor the fleet's performance on a continuous basis, identifying further actions to be taken and preparing reports for senior management.

A Team Effort

The provincial government is contributing a significant amount of time and attention to making the objectives of this fleet-management program a reality. A Transportation Energy Management Program has recently been created and is administered by the Ministry of Transportation and Communications in cooperation with the Minister of Energy. **Drive Propane, DriveSave, Teleconferencing,** and **Trucksave** are but a few conservation initiatives covered in this comprehensive program.

In addition, the Municipal Energy Program supplies funding for innovative municipal conservation measures, conducts demonstration projects on provincial roadways, and provides technical information and support for municipal efforts in the energy management of fleet operations. For municipalities requiring more information about the measures discussed in this booklet, or about any other urban-transportation energy-conservation matter, the following studies can be obtained from the Ontario government.

Municipal Fleet Management

The detailed report upon which this summary booklet was based is included as chapter 6 of the **Transportation Energy Analysis Manual** (see below).

Transportation Energy Analysis Manual (TEAM)

A comprehensive summary of a wide range of diverse conservation measures in the following areas: demand management, contingency planning, road construction and maintenance, transit-service improvements, ride-sharing, and street-system improvement. (July 1982). *Write to:*

TEMP, Ministry of Transportation and Communications
1201 Wilson Avenue, Central Building, 3rd Floor
Downsview, Ontario
M3M 1J8
(416) 248-7296

Traffic Management Measures to Reduce Energy Consumption

(August 1981). *Write to:*

TEMP, same address as above.

The Transportation Energy Management Program (TEMP)

Concerned with the reduction of oil dependence in the transportation sector. *Write to:*

TEMP, same address as above.

The Municipal Transportation Energy Advisory Committee (MTEAC)

Established to provide guidance, technical assistance, and coordination to municipally conducted conservation programs. *Write to:*

Mr. Frank Cherutti, Executive Secretary, MTEAC
(Same address as above)

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